

MODIS Team Meeting Minutes

Minutes of the MODIS Team Meeting held on Tuesday November 15, 1994.

Action Items:

94. Provide a detailed (high fidelity) analysis of scatter in the scan cavity. The results would determine the need for PF near field scatter measurements vs scan angle. Assigned to Guenther 8/23/94 Preliminary results due 10/15/94. Final due 2/28/95.
97. Review the SBRC IR&D report on the Indium Bump process and provide comments on acceptability. Assigned to Roberto, Martineau, and Ellis 9/30/94. Due 10/ 4/94. CLOSED 11/15/94
100. Devise an electronic distribution and communication system to use when GSFCMAIL shuts down. Assigned to Bauernschub 10/25/94. Due 11/29/94.
101. Provide an assessment of the SBRC test plan to measure radiometric accuracy as a function of scan angle position (sections 11.6.3 and 11.7 of the Performance Verification Plan). Assigned to Guenther 10/25/94. Due 11/29/94
102. Review and report on the assigned SBRC test specifications and procedures. Assigned to Waluschka 10/31/94. Due 11/22/94
103. Review and report on the assigned SBRC test specifications and procedures. Assigned to Martineau 10/31/94. Due 11/22/94
104. Review and report on the assigned SBRC test specifications and procedures. Assigned to Ferragut 10/31/94. Due 11/22/94
105. Review and report on the assigned SBRC test specifications and procedures. Assigned to Daelemans 10/31/94. Due 11/22/94
106. Review and report on the assigned SBRC test specifications and procedures. Assigned to Florez 10/31/94. Due 11/22/94
107. Review and report on the assigned SBRC test specifications and procedures. Assigned to Davis 10/31/94. Due 11/22/94

Attendees:

✓ Richard Weber	✓ Bruce Guenther	Larissa Graziani
✓ John Bauernschub	George Daelemans	✓ Bob Martineau
Rosemary Vail	Patricia Weir	✓ Bob Silva
Lisa Shears	Mitch Davis	✓ Robert Kiwak
✓ Mike Roberto	✓ Ken Anderson	✓ Harvey Safren
Nelson Ferragut	✓ Rick Sabatino	✓ Ed Knight
✓ Gene Waluschka	✓ Cherie Congedo	✓ Harry Montgomery
✓ Bill Barnes	✓ Jose Florez	Marvin Maxwell
Les Thompson	Gerry Godden	✓ Bill Mocarsky
	Sal Cicchelli	✓ Helen Phillips

The following items were distributed:

- 1) Weekly Status Report #164
- 2) SBRC Memos submission from week #156
- 3) Minutes of the previous team meeting

MODIS Technical Weekly

November 18, 1994

El Segundo Facilities Trip

A trip is planned for a visit to Hughes' facilities at El Segundo on November 29. The plan is to meet at building E1 at 9 am. Attendees from GSFC will be Bob Silva, Larissa Graziani, Pete Rossoni, Ed Packard, and Ken Gardner. The Code 754 personnel been provided copies of the MODIS Engineering Development paper by Tom Pagano, the spec, GIIS, UIID, and PAR. SBRC plans to provide a person for the tour of facilities. The goal is to determine the adequacy of the facilities planned for MODIS.

Instrument Specification

Tom Pagano has raised the following issues:

- 1) Spec paragraph 3.4.3 Minimum Quantizing Resolution: This spec paragraph states that:

"... Differential linearity of any signal quantizer shall be better than 0.5 of the least significant bit (LSB). "

If the differential linearity is characterized, then the non-linearity of every bit pattern from 0 to 4095 is determined.

Ken Shamordola has characterized the A/D converter integral non-linearity. He used a sine wave and computes a curve that shows non-linearity between 0 and 4095 bits. However, the data he gets skips about 3 out of every four bits. This characterization is for the A/D converter by itself. The question is whether Ken's characterization can be used to show compliance to this requirement.

GSFC response: This issue was provided to GSFC electronics personnel for review on November 18.

- 2) Spec Paragraph 3.4.5.3.1 Channel to Channel Uniformity This spec paragraph states that:

"... For all live channels, the calibrated mean output of each channel with respect to every other channel shall be matched to within the values of NE_{DL} given in Table 3.3.4.1 for bands 1-19 and to within the values of NE_{DL} given in Table 3.3.4.2 for bands 20-26. This matching condition shall be met when the instrument views a uniform constant spectral radiance field at levels of approximately 0.5L_{typical}, L_{typical} and 2L_{typical} (or L_{max}, if L_{max} < 2 L_{typical}). This requirement does not apply in the high temperature ranges of the non-linear (fire) bands."

GSFC response: This spec is meant to assure the calibrated output does not have striping. In operation, the outputs of the channels are single sample outputs. However, the spec states mean output which implies sample averaging. One approach to consider is to compare on the basis of single samples, but compare the results to 3 NE_{DL}s, since one NE_{DL} is a standard deviation. Ed Knight, Bruce Guenther, and Bill Barnes believe this approach would be okay.

Cherie Congedo -

Cherie has an estimate of the cost to have interference checks done for MODIS using Pro E. The estimate is \$20K.

Rick Sabatino -

Responsibility for the Test Analysis Controller (TAC) software has been passed to Tom Pagano.

Jose Florez -

1. Plessey has identified 30 parts out of the 80 parts which were found by SBRC to be visually acceptable that meet worst case requirements for speed, high temperature, and low voltage. Some question about how many are above 13.3 MHz, which is needed for MODIS in order to provide a little margin. However, some of the parts operated at 14 MHz.
2. The FDDI output for the MEM does not look right.
3. While the cover was being put on the CLAM, one of the wires was shorted.

Bob Martineau -

1. VIS SCA status: VIS SCA is into test. No problems to date. Software validation for qual testing is in progress. Crosstalk measurements to be taken for Tom Pagano next week. NIR SCA is in queue for test.
2. LWIR SCA selection: All LWIR SCAs have larger offset voltages than expected (4 volts vs 3 volts). Otherwise the units look beautiful. Large offset implies noise problems for downstream electronics. The electronics will be modified to correct the noise problem and will not affect performance.
3. SMWIR status: A PF candidate SCA has been identified. It has one noisy out of spec pixel which cannot meet system requirements. Other pixels are below flowdown NEI specs but meet Tom Pagano's system requirements. Tom Pagano accepted the unit. Another SCA will be tested as a backup. I have asked for a faxed performance summary.

SBRC expects to have 9 sets of subarrays to get 4 flight units. Testing is continuing. Joe is recommending not starting an additional lot. Assets will be reviewed and a decision will be made this Thursday. I think it will be hard to get the needed units from the present asset base.

4. PC detectors (F1&F2): A 2- and a 4-band set have been identified for F1. There will be an NCMR for the crosstalk spec. A 4-band backup has been identified and a 2-band backup is in for final inspection. F2 parts are in test.

Eugene Waluschka -

Shi-yue Qiu (pronounced Chu) is modifying Eugene's ray trace code to evaluate the optical performance of the intermediate focal planes for the S/MWIR and LWIR. This involves taking into account the wavelength of the ray (center wavelength of each band is used). The optical filters are considered ideal for this model. For example, a blue ray will be reflected if it hits a red transmission filter.

Eugene is using his ray trace code to implement a scatter model. At a surface, a ray will be refracted or reflected. Based on an analytical BRDF model, an angle will be determined for a scattered ray at the surface. From then on, the scattered ray will be reflected or refracted at each surface in the usual way. The argument is that scattering from the scattered ray would not be significant. The scattered ray will be weighted. Ray intensity will be handled either by a weight factor or by using more rays to indicate higher intensity.

For his ray trace work, Eugene is now using a DEC Alpha machine with a VMS operating system. For this ray trace code, the machine can do 106,000 ray surfaces per second.

Bill Mocarsky -

A brief update concerning GSE Status:

1. Fixtures:

The Modis system fixture is complete, has been load tested and has been

mated to the rotary table. This allows the OBA to MF integration to occur this week.

2. DMCF - The dedicated Modis Calibration facility (tv chamber) is in and has been installed. They are running pumpdown checks now.

3. Polarization Source Assembly - should be in 21 NOV. It will need to be calibrated. It is expected to be ready for use 1st week of Dec.

4. Spectral Measurement Assembly/ and Scatter Measurement Assembly look like they will be available mid Dec instead of 1st of DEC.

5. It looks like Hughes is planning to build a clean room for Modis at El Segundo. - Estimated completion date is July 95(?).

6. Vern may be losing Tom Moreno (?) an OASIS guy. He will know by the end of the week. This is his last OASIS guy.

7. System's Engineering is asking Vern to automate some of his stimuli that he had not planned to automate. This is new work. He will be figuring out impact and make internal recommendations first. The work will require new OASIS software. That could be a problem.

I&T Status:

Talked with Duane Bates. He says he wants to maintain a schedule showing going into the TV chamber in February (as before). He thinks he can make up the time by going 2 shifts.

Immediate schedule:

End of this week - OBA to MF complete. Early next week - Alignment checks

Later next week - MEM integration start (I heard that the MEM was delayed)

2nd Week DEC - Blackbody I&T.

Currently about 1 month out of bed with schedule presented at Sept Quarterly.

Instrument Within Band RMS Deviations and Radiance Test Levels

In a mail message from Tom Pagano on November 11, he raised questions about the difference between the RMS Deviation paragraph (3.4.5.3.1) of the spec and the channel to channel uniformity spec (3.4.5.3.2). There was also the possibility that SBRC may not be able to match precisely the fractions of Ltyp required in paragraphs 3.4.5.3.2 and 3.4.5.5.

A response was prepared by Bill Barnes, Ed Knight, and Mike Roberto. The RMS deviation paragraph gives an overall requirement for a spectral band. The channel to channel uniformity spec assures that no detector in a band will be significantly different in output from any other detector in the band. The latter is designed to assure there is no striping. We believe that it is technically acceptable if the SIS or BCS radiance levels bound the spec levels. Details are in an email message to Tom Pagano dated 17 November.

Systems Engineering Minutes

The following minutes are from Tom Pagano. Systems Engineering Minutes for 11/15/94

Consent to Integrate Meetings. CTI's are to be held for all major EM subassemblies. It was suggested that we separate out the "test report" section from the drawing/NCMR configuration reporting.

Opto-Mech: DeForrest; Only one on the table at this time are the sine vibration requirements. The three door assemblies represent a high risk for damage if vided at the unit level. He is looking at designing a notch in the vibration spectrum for these assemblies so we can move forward on the procurement. Also the rad cooler suspension bands may be under risk if exposed to a sine vibration test. I&T support with J. Bell and J. Neumann.

Optics: Kampe; Revising Scan mirror and afocal telescope procurement drawings to incorporate scatter requirements. Have protoflight optics in procurement. VIS parts are expected by the end of the month. The 5 zone mask is in procurement. NASA will have an opportunity to review the spec if interested. Will provide the data necessary to perform PF performance modeling to T. Pagano by the end of the week.

Therrien. Testing is needed to determine the origin of band 5,6 and 1,2 width errors. We have no LSF data at the detector level for these bands in the scan direction.

FPA's: Dowler; Test are performed on sister die on band 7. Another SW/MW SCA was hybridized, and is in test today. It should be better than the one we've already looked at that had one pixel with noise problems. Crosstalk test are in process on the proof-of-design array. The reticles have been fabricated. The LW SCA's don't meet their dynamic range requirements by about 10-20%.

Pagano. This has been observed. We are working with K. Shamordola to get the electronics to give us more gain and offset. We may pay some noise penalty, but these bands aren't suffering in SNR.

GSE: Alferd; The PSA parts are in, and the controller has been delivered to Teletrak. The PSA has not yet been assembled, but should be ready for delivery by November 21st. We then need 5 days to perform acceptance testing. We lost our labview and OASIS people, and are working on replacements ASAP. The ScMA is in good shape. All materials are in house except the smooth mirror. Aerotek mounts are due imminently. The SpMA will also use Labview on the MAC.

TAC Software: Phan. The TAC software is coming together. We've coded up the polarization, gain and offset, registration and SNR algorithms to date, and are working on some final details. We should have a partly working system by Christmas.

Algorithms: Pagano. Finished a couple more algorithms, should have document complete by Friday.

End of Tom's report.

Systems Engineering Action Items

The latest version of the action items list was received from Tom Pagano on November 15. There are 47 items on the list. Eleven of the action items have been closed.

There are two open items are for NASA: 1) Complete MODIS Simulator

2) Complete screen design for solar diffuser viewport

Larissa Graziani -

There are no access holes through the fairing that are near MODIS. However, the environment in the vicinity of the fairing will be controlled on the launch pad. Also, charcoal and HEPA filtered air will be flowed through the fairing, and a positive fairing air pressure is planned. Temperature and humidity control in the area near the fairing will assure the instrument stays above the dew point. GN2 purging of MODIS on the launch pad should not be needed and would likely not be possible for much of the time.

Claire Wilda -

Claire is interested in our comments on the Instrument Flight Operations Understanding (IFOU) document and the Command and Telemetry Interface Control Document (C&T ICD). Claire plans to combine these two documents into one document. This would be in a December or January time frame.

MODIS Spec and Performance Verification Plan/Spec Matrix Review

Bill Barnes, Ed Knight, Dick Weber, Ken Anderson, and Mike Roberto reviewed Tim Zukowski's Verification Compliance Matrix for the MODIS spec which relates each specification requirement to a paragraph (if applicable) in the PVP/PVS on November 16. Comments were compiled by Ed Knight and provided in an email message dated November 17.

George Daelemans -

In a memo dated November 7, George summarizes an analysis performed by Dan Powers which determined that no stray light from the solar array can enter the MODIS scan cavity. Minimal stray light does hit the interior of the sunshade, aperture door, and scan aperture panels. High specularity was assumed for the solar array and maximum angle between the solar array and the sun vector for worst case assumptions. This analysis also ignored SBRC's latest aperture lip baffle located on the -y side of the instrument.

It should be noted that these are preliminary results. This was a very quick examination and any possible limitations of the software for this type of analysis are not known at this time. (Also, Gerry Godden has expressed a concern about the impact of possible bending of the solar array.)

The latest version of the MODIS thermal model was used for this analysis. This model was translated into a format for the Net Energy Verification And Determination Analyzer (NEVADA) program. One million rays were fired at MODIS from the sun for each of 13 orbit positions. Up to 2246 rays hit the inner sunshade/door. For one angle, 13 rays hit the exterior of the aperture panel.

Quality Assurance Telecon on Focal Plane Temperature Sensor Waiver Request

This telecon was held on Friday, November 18. Attendees at GSFC included Bill Barnes, Gary Bhatia, Bob Silva, Ken Anderson, and Mike Roberto. At SBRC, attendees included Lee Tessmer, Lou Trautwein, Tom Pagano, Mary Dowler, and others. Tentative conclusions were as follows:

- 1) There is a life test from the same lot being done now for a NASA program at Lake Shore Cryotronics. The results from this test should be applicable to the MODIS temperature sensor diodes.
- 2) There are 24 temperature sensors which have not yet been mounted on focal planes. These 24 should be burned in (160 hours at 100 degrees C).

Six temperature sensors have been installed on PFM focal planes (one for each focal plane plus one for each of two back up focal planes). There are no redundant temperature sensors on the focal planes. Removing the installed temperature sensors and installing sensors which have been life tested (1000 hours) and burned in would risk possible damage to the focal planes.

The cooled focal planes have one sensor for fine temperature control and one for course temperature control (one sensor for each focal plane). For the cooled focal planes, the same sensor is used for temperature readout and control. The temperature control can be turned off. For the cooled focal planes, there are no nearby temperature sensors.

The temperature sensor for each warm focal plane is just used for temperature readout. If a temperature sensor fails, there are sensors near by for the warm focal planes.

Mike Roberto

November 18, 1994